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|-----------------|-------------|----------------------|---------------------|------------------|
| 10/676,585      | 09/30/2003  | Shriram Ramanathan   | 42P17607            | 7967             |

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EXAMINER

NGUYEN, TUAN H

ART UNIT PAPER NUMBER

2813

DATE MAILED: 08/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/676,585

**Applicant(s)**

RAMANATHAN ET AL.

**Examiner**

Tuan H. Nguyen

**Art Unit**

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 June 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 1-10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 11-12, 15-21, 25-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Macris'330 (cited ref.).

Macris, figs. 1-20 and related text, particularly figs. 8A-8C discloses the claimed wafer assembly comprising a bare wafer 35 (fig. 8B, and paragraph [0113]); an active wafer 60 having at least an active device 62 (fig. 8A, and paragraph [0112]) bonded to the bare wafer 56 by the backside (fig. 8C, paragraph [0113]); at least a thermoelectric film 28 on the bare wafer 35 located at a location matched to an area localized (active circuitry 62) on the active wafer 60 that needs thermal control (fig. 8C).

Paragraph [0075], lines 1-5 discloses the heat source 10 may be an IC chip or other electronic component that needs thermal control. The heat source 10 corresponds to a localized hot spot on the active wafer that needs thermal control to dissipate heat. Paragraph [0077] also discloses, "This thermal anisotropy or directional

heat transfer, is more effective at removing thermal energy from a localized heat source than conventional materials such as metal.”

With respect to claims 15-19, 26, fig. 8C shows the thin active wafer 58 is bonded to the bare wafer 56 through an interlayer 64 in alignment, and the thermoelectric film 28 having heat absorbing junction 30 fabricated at location corresponding to a localized hot spot on the active wafer to maximize heat spreading (see paragraphs [0114]- [0120]).

With respect to claim 12, see paragraph [0079].

With respect to claims 20, 21, 27, 28, see fig. 2, wherein the bare wafer 28 has power signal 22 to control the at least thermoelectric film (paragraph [0077]).

Claims 11-28 are rejected under 35 U.S.C. 102(e) as being anticipated by ~~et al.~~ Cordes et al. (cited ref.).

Cordes, figs. 2A-2C and text on col. 4-6 teaches the claimed wafer assembly including a bare wafer 339 having a backside; an active wafer 302 bonded to the bare wafer 339 by the backside, the active wafer 302 having at least and active device formed in layer 309 (col. 4, third paragraph); and at least a thermoelectric film 358, 360 on the bare wafer 339 (fig. 2B) located at a location matched to an area (localized hot spot) on the active wafer 302 that needs thermal control (col. 7, lines 58-64).

With respect to claims 12-14, 22-24, see col. 5, second paragraph, col. 6, first paragraph.

With respect to claims 20, 21, 27, 28, see col. 6, last 4 lines.

With respect to claims 16-19, 26, fig. 2c and col. 6, thin wafer 302 is bonded to bare wafer 339 in alignment through an interlayer coated bond solder 334, 336, 364, 366 by heating.

Claims 11, 15, 16, 17, 18, 19, 20, 21, 25, 26, 27, 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Chu et al..

Chu et al., figs. 1-4 and text on col. 4-6 that discloses the claimed wafer assembly including an active wafer 14 bonded to a bare wafer 18 by the backside, at least a thermoelectric film 30 on the bare wafer 18 located at a location matched to an area localized on the active wafer that needs thermal control (fig. 3B).

With respect to claims 18, 26, see col. 5, lines 53-54, thermal paste 19 coated on the backside of the bare wafer 18.

With respect to claims 15, 16, 25, see col. 4, lines 19-21, col. 5, lines 22-24.

With respect to claims 20, 27, 28, see col. 6, third paragraph for applying electrical power to control the thermoelectric unit.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 11-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. in view of Cordes et al. (cited ref.).

Chu et al., figs. 1-4 and text on col. 4-6 that discloses substantially the claimed wafer assembly as explained above except silent about the thermoelectric materials.

Cordes et al., figs. 2C and text on col. 6, lines 5-11 teaches the use of a desired of composition of Bi, Sb,Te for forming thermoelectric element on a substrate to remove heat at a location matching the heat dissipation of the juxtaposed integrated circuit of the die (col. 7, lines 59-60).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed the thermoelectric element by using well-known alloy of Bi,Te or Sb, Te, or Zn, Sb composition as disclosed by Cordes in Chu et al. thermoelectric film for removing heat from the integrated circuit or other electronic components, and improving the device performance.

### ***Response to Arguments***

Applicant's arguments filed 6/15/06 have been fully considered but they are not persuasive.

Note the newly amended claims that recite "a thermoelectric film on the bare wafer located at a location matched to an area localized on the active wafer that needs thermal control" does not require the thermoelectric film to be squarely located within the area localized on the active wafer that needs thermal control. As long as the

thermoelectric film is matched to the area that needs thermal control as disclosed by Macris, it satisfies the requirement.

With respect to the applicant's argument in his Remarks, page 6, next to last paragraph that the thermoelement from Macris is structurally different from the thermoelectric film, however, by simply recite the thermoelectric film without any structure limitations in the instant claims, it is broad enough to read on the thermoelement from Macris.

With respect to claims 27, 28, contrary to the applicant's argument on page 7, last paragraph that "the power leads 22 are used only to apply electric potential across the heat sink 12 and induces charge carrier flow 24", in fact, Macris paragraph [0077] also discloses "(electron flow in metals, electron and hole flow in N and P-type semiconductor respectively)". This is used to control the heat flow.

With respect to Cordes reference, col. 6, last paragraph to col. 7, second paragraph discloses the use of DC voltage to control the heat flow as recited in claims 27, 28; fig. 2C shows active wafer 302 having at least an active device bonded to the bare wafer 339 with thermoelectric film located at a location matched to an area localized on the active wafer that needs thermal control. The instant claims do not require that the thermoelectric elements are individual thermoelectric attached to the bare wafer as well as the step of thinning the substrate as argued on page 12 (note also that these are structure claims, not process claims; therefore, the process of fabricating are irrelevant).

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

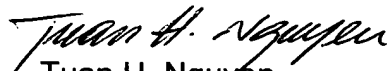
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan H. Nguyen whose telephone number is 571-272-1694. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Tuan H. Nguyen  
Primary Examiner  
Art Unit 2813